WATER QUALITY B

See General Rules, Eye Protection & other Policies on www.soinc.org as they apply to every event.

1. **DESCRIPTION:** Participants will be assessed on their understanding and evaluation of marine and estuary aquatic environments.

   A TEAM OF UP TO: 2 **APPROXIMATE TIME:** 50 minutes

   EYE PROTECTION: C **CALCULATOR:** Class II

2. **EVENT PARAMETERS:**
   a. Each team may bring writing utensils.
   b. Each team may bring two Class II calculators.
   c. Each team may bring one (1) 8.5" x 11" sheet of paper that may contain information on both sides in any form and from any source. The sheet of paper may be laminated or placed in a sheet protector to increase durability. Affixed labels, as well as multiple sheets of paper (whether in a single sheet protector or not) are prohibited.
   d. Each team may bring one student built salinometer/hydrometer for testing.
   e. Participants must wear Category C eye protection during Salinometer Testing (3.Part IV). Teams without proper eye protection must be immediately informed and given a chance to obtain eye protection if time allows.

3. **THE COMPETITION:** This may include analysis, interpretation or use of charts, graphs and sample data. Supervisors are expected to utilize **marine and estuary** scenarios and have students analyze and evaluate comparative macroinvertebrates and water quality data. Process skills may include equipment use, collecting and interpreting data, measuring, analyzing data, and making inferences.

   Part I: Marine and Estuary Ecology – 30% of the total score
   a. This part will use multiple choice, matching, fill-in-the-blank and/or short answers to assess participants' knowledge.
   b. Core knowledge areas may include aquatic ecology, water cycle, nutrient cycling, aquatic chemistry and its implications for life, potable water treatment, waste water treatment, aquatic food chains/webs, community interactions, population dynamics, and the importance of watersheds.
   c. Additional applied topics may include: importance of estuaries, watershed resource management issues, sedimentation pollution, harmful species, recently killed coral, harmful algal blooms (HABs), emerging contaminants (e.g. medicines and chemicals like PFAS), and the five ocean garbage patches.

   Part II: Coral Reef Macroflora and Fauna Identification – 30% of the total score
   a. This part will assess participants' knowledge of coral reefs and the ecological factors that have harmful effects on reef ecosystems. It will also include the identification (common name only) of Coral Reef organisms and their importance as indicators of reef health.
   b. Participants are also expected to know the general ecology, life cycles, and feeding habits of the following organisms (note: spp. is an abbreviation for multiple species):
      i. Organisms found around the globe:
         (1) Banded coral shrimp (*Stenopus hispidus*),
         (2) Butterfly fish (*Chaetodon* spp.),
         (3) Crown of thorns starfish (*Acanthaster planci*),
         (4) Fleshy algae (**Rhodophyta, Chlorophyta, Phaephyta**),
         (5) Grouper >30 cm (Serranidae, Epinephelinae),
         (6) Hard/**Stony** corals (**Scleractinia**),
         (7) Lobsters (**Nephropidae**),
         (8) Long-spined black sea urchins (Diadematidae/Diadema spp.),
         (9) Moray eel (*Muraenidae*),
         (10) Parrotfish (>20 cm) (Scaridae),
         (11) Pencil urchins (**Eucidairis spp**.),
         (12) Sea Cucumber (Holothuroidea),
         (13) Snapper (*Lutjanidae),*
         (14) **Demosponges** (**Demospongiae**)
         (15) Sweetlips (*Haemulidae*)
         (16) Triton (***Charoniidae***/Charonia spp.).

ii. Organisms found in the Indo-Pacific region only:
  (1) Barramundi cod (*Cromileptes altivelis*),
  (2) Bumphead parrotfish (*Bolbometopon muricatum*),
  (3) Giant clams (*Tridacna* spp.),
  (4) Humphead wrasse *(Cheilinus undulatus).*

iii. Organisms found in the Atlantic region only:
  (1) Flamingo Tongue Snail *(Cyphoma gibbosum*),
  (2) Gorgonia (Octocorrallia),
  (3) Nassau grouper *(Epinephelus striatus).*

Part III: Water Monitoring and Analysis – 30% of the total score

a. Participants are expected to understand and interpret data related to testing procedures and purposes for collecting data related to salinity, pH, phosphates, turbidity, dissolved oxygen, temperature, nitrates, fecal coliform, total solids, biochemical oxygen demand and aragonite saturation and their relationships to one another.
b. No physical, laboratory tests will be performed on these topics by participants.

Part IV: Salinometer Testing – 10% of the total score

a. Teams must build, calibrate, bring and demonstrate a salinometer/hydrometer capable of measuring saltwater (most likely NaCl) concentrations between 1-10% (mass/volume). Students may build a simple electronic salinometer if they wish. No programmable devices or those that can communicate over WiFi are allowed. No laptops, tablets, or other similar devices may be used in the competition.
b. There are no restrictions on size except that the team must build the device to operate within a standard 400 – 600 mL beaker filled with **at least 400 mL of** the saltwater solution.
c. Teams will be expected to estimate the percent salinity measured by their device to the nearest tenth of a percent. Full credit will be given ±1% at Regionals and ±0.5% at State/Nationals. Calibration solutions may or may not be provided by the Event Supervisor.

4. **<u>SCORING</u>:**

a. High Score wins.
  i. Points will be assigned to the various questions and problems for Parts I, II, and III.
  ii. Points for bringing a salinometer for testing will be 5% of the total score.
  iii. Points for making an accurate salinity measurement per 3.Part IV.c will be 5% of the total score.
b. Preselected questions will be used as tiebreakers.

This event is sponsored in partnership with Current and the NSF Great Lakes RENEW Engine.